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Cardno ENTRIX

13700 Ben C. Pratt
Six Mile Cypress Pkwy, Suite 1
Fort Myers, FL 33912
USA

Phone **239 574 1919**
Toll-free 800 368 7511
Fax 239 574 8106
www.cardno.com

www.cardnoentrix.com

Ms. Inga Williams, AICP
Principal Planner
Charlotte County Community Development Department
18500 Murdock Circle
Port Charlotte, FL 33948-1094

Subject: Calusa Green Solid Waste Disposal Facility Site Plan Review
Hydrogeological Consulting Services
Professional Services Library RLI 2010000335
Work Order #41 – File #2012000335, HYDROLOGIST CONSULTANT

Dear Ms. Williams:

Cardno ENTRIX is pleased to submit this technical memorandum for the review of geologic and hydrogeologic elements of a site plan review application submitted for the proposed Calusa Green Solid Waste Disposal facility in Charlotte County, Florida.

Introduction

Cardno ENTRIX was authorized by Charlotte County to review the submitted site plans, calculations, surveys, data, and other pertinent information submitted for the *Site Plan Review Application of the Calusa Green Class I, C & D, Biosolids Compost, and Recycling Solid Waste Management Facility*. Cardno ENTRIX was tasked with assessing the submitted documents relative to geologic or hydrogeologic aspects. This technical memorandum provides an assessment of the application's completeness and technical merit with respect to geologic and hydrogeologic aspects.

The assessment of the application was conducted in three phases. The first phase was to review the submitted materials for completeness and adherence to the applicable rules and regulations. The second element was a general review of the application's engineering elements and their potential effect on the site geology and hydrogeology. The third aspect of the review was an evaluation of submitted geologic and hydrogeologic data to establish their applicability to assess potential impacts.

The primary purpose of the review is to assure that the application package meets the intent of the *Smart Charlotte 2050 Comprehensive Plan* (Comprehensive Plan) *Municipal Solid Waste (MSW) Objective 2.3 - Solid Waste Facility Siting*: "To site solid waste collection and disposal facilities in a manner that protects the natural and community resources of the County".

Regulatory Review

A review of the application documents was performed for adherence to the requirements of Federal, State, and local rules and regulations applicable to siting and permitting solid waste disposal facilities. It should be noted that the Calusa Green Site Plan Review Application is for

use of the site as a landfill facility location and not a formal application for a landfill. The technical review did, however, assess the application's compliance with criteria required for permitting the facility to assure that, as noted in the County's Comprehensive Plan MSW Policy 2.3.2 Siting Requirements, "The County shall require any proposed solid waste collection and disposal facilities to be sited in accordance with all applicable land development regulations and other local, regional, State, or Federal regulations".

Federal Regulations

Federal Regulations pertaining to elements of landfill siting are diverse and apply generally to the larger fundamentals such as water quality and the environment. Selected Federal Regulations reviewed included *U.S. Public Law 92-500 - Federal Water Pollution Control Act* ("Clean Water Act"), *Clean Drinking Water Act of 1972*, and the *Water Quality Act* (1987). Federal Regulations apply to multiple aspects of site suitability of a landfill. However, Federal Regulations are not the most pertinent rules to assess the application for the Calusa Green facility. State and local rules and regulations, which are governed by Federal statutes, are the most appropriate rules to assess the application.

State Regulations

The rules and regulations of the South Florida Water Management District (SFWMD) and the Florida Department of Environmental Protection (FDEP) are among the most important State regulations to assess the suitability of the Calusa Green facility.

FDEP regulations including *Chapter 62-701 F.A.C. Solid Waste Management Facilities* address the requirements of permitting a Class I Landfill in Florida. *Chapter 62-330 F.A.C. Environmental Resource Permitting* addresses stormwater management requirements and *Chapter 62-40 F.A.C. Water Resource Implementation Rule* addresses water quality management.

The SFWMD has promulgated rules (*Basis of Review*) pertaining to Environmental Resource Permits (ERP) and Water Use Permits (WUP). The SFWMD Basis of Review documents set forth the environmental, surface water management, water quality, resource impact assessment, and demand requirements to permit projects within the SFWMD. The project site currently maintains both surface water management and water use permits. The surface water management for the site is permitted under ERP No. 08-00006-S and irrigation water use is permitted under WUP No. 08-00006-W.

The most pertinent section of the State rules pertaining to the technical review of the Calusa Green application is *Rule 62-701.410 F.A.C. - Hydrogeological and Geotechnical Investigation Requirements*. In this section, the requirements of the investigation plan are set forth. The technical review of the submitted plan documents show that many of the requirements are met. However, there are missing items. No discussions of either surface water quality or groundwater quality were addressed. There were incomplete discussions of the hydraulic connection between aquifers and the hydraulic properties of the aquifers. No average or maximum high groundwater levels were addressed. The geotechnical report addressed the surficial sediments but did not contain the required discussion of site foundation suitability.

No discussion of the source of water supply or water use permitting for the facility was addressed. The facility is located in an area that does not have a municipal public water supply and potable and industrial water supplies will be required for the site. In addition, SFWMD water use and environmental resource permits will be needed to permit on-site water use.

Local Regulations

The most pertinent local rules and regulations relating to the site plan review are the *Code of Laws and Ordinances of Charlotte County* (County Code) and the *Smart Charlotte 2050 Comprehensive Plan*.

The applicable portions of the County Code include *General Ordinances and Special Acts, Chapter 1-12 Solid Waste; Part III*, *Land Development and Growth Management, Chapter 3-9 Zoning* and *Chapter 3-10 Comprehensive Plan*. Article V of Chapter 1-12, known as the *Charlotte County Solid Waste Management Facility Siting Ordinance*, has the greatest direct impact on the assessment of the site plan review application.

Applicable portions of the Comprehensive Plan include *Future Land Use Element (FLU) - Goals, Objectives and Policies*; *Natural Resources (ENV) - Goals, Objectives And Policies*; *Infrastructure - Stormwater Management (SWM) - Goals, Objectives And Policies*; *Infrastructure - Municipal Solid Waste (MSW) - Goals, Objectives and Policies*; *Infrastructure - Groundwater And Aquifer Recharge (AQR) - Goals, Objectives And Policies*; and *Supporting Data and Analysis Map Series* – "SPAM Series".

A map of the County's Watershed Overlay District is provided in the Comprehensive Plan as *Future Land Use Element Map #4: Watershed Overlay District*. This map shows that the Calusa Green facility is located within the Watershed Overlay District. Although the project site does not lie within the 1/2 Mile Setback of either Shell Creek or Prairie Creek, the project is located within the Shell Creek and Prairie Creek Watershed Study areas.

Future Land Use Element Map #6: Prime Aquifer Recharge Areas shows that the facility is located within the recharge area identified in the northeastern portion of the County. Although the recharge area has relatively low recharge values (0.0 to 1.0 inches per year) it is the only designated recharge area in the County and as such, it is designated as the prime aquifer recharge area. The siting of the proposed facility within this designated area makes the assessment of potential impacts an important aspect of the project review. Groundwater and Aquifer Recharge Data and Analysis provided in the Comprehensive Plan notes that the "*area of prime aquifer recharge should be encouraged to remain relatively undeveloped in order to protect these* (recharge) *capabilities*". AQR Policy 1.1.1 Prime Aquifer Recharge Protection requires that *"The County shall limit impervious surface area within areas of prime aquifer recharge (FLUM Series Map #6) to ten percent, thereby allowing for the greatest amount of water to infiltrate the ground"*.

The technical elements of both the Comprehensive Plan and the County Code require a demonstration that the proposed facility will not adversely affect the natural and community resources of the County. The application submittal does provide a relatively complete documentation of the steps needed to prevent adverse impacts to the natural resources. However, there are some items that require additional elaboration (refer to the State Regulation portion of this section and the following Geologic and Hydrogeologic Review section for additional information).

General Engineering Review

Engineering review was limited to project elements that might influence groundwaters or surface waters relative to regulatory standards. The review did not focus on issues relative to wetlands, either on-site or off-site.

Surface Water/Stormwater Management

The proposed design criteria for the landfill's surface water management system, specifically that the system will be designed to prevent discharges from the 100-year, 72-hour storm, is conservative and it should provide a reasonable safeguards and meet downstream water quality standards. The proposed design should meet or exceed requirements of the FDEP and SFWMD.

Landfill Design Criteria

The FDEP standards for engineering design that relate to groundwater protection focus on hydrogeologic properties of the subsurface, landfill liners, leachate management, and groundwater monitoring. For the proposed Calusa Green landfill, the description of elements to be included in the design of the composite liner system indicates that it would comply with the FDEP standards for a Class I landfill. The general description of the leachate management system appears to meet FDEP standards. The FDEP requirements regarding landfill construction, the

associated liner criteria, leachate management, and monitoring are very comprehensive. Details of design to meet these requirements would not be expected at this point in the project approval process.

Geologic and Hydrogeologic Review

Potential concerns regarding land use at a given site include reduced recharge due to increased impervious surfaces, potential contaminant releases migrating to underlying aquifers, and potential contaminant releases migrating to surface water bodies. These concerns can be addressed by characterizing the nature of surface water and groundwater movement. Topography, lithology, water chemistry, water elevations, and hydraulic flow characteristics of aquifers affect the nature of water movement.

Cardno ENTRIX reviewed the Calusa Green application package submitted to Charlotte County to evaluate hydrogeologic and geologic elements of the submittal. The majority of hydrogeologic and geologic elements of the application were included in the *Preliminary Hydrogeological Investigation Report Calusa Green Solid Waste Management Facility, Charlotte County, Florida* (Progressive Water Resources, LLC, May 10, 2012). This report includes, in part:

- The results of ten (10) on-site soil borings advanced to a depth of 50 feet on-site
- Water level and slug test data from three piezometers installed on-site to about 20 feet depth within the Surficial Aquifer System (SAS)
- Data on wells located within one mile of the site
- Regional hydrogeologic information including a discussion of regional aquifer water levels and confinement based on limited site data and public records
- Topographic information related to off-site surface water flow

The primary aquifers underlying the project site include the Surficial Aquifer System (SAS), the Intermediate Aquifer System (IAS), and the Floridan Aquifer System (FAS). The IAS may have three water producing zones PZ-1, PZ-2, and PZ-3. Production Zone PZ-1 is not contiguous in the region, but PZ-2 and PZ-3 are in significant use in Northeastern Charlotte County (*Assessment of Minimum Levels for the Intermediate Aquifer System in the Southwest Florida Water Management District*, Basso and Hood, 2005). Refer to Exhibit A for maps from Basso and Hood (2005) which show PZ-2 and PZ-3 use.

The Preliminary Hydrogeological Investigation Report (PHIR) indicates that the hydrogeologic character of the shallow sediments of the SAS that overlie the IAS exhibit poor permeability. Due to this poor permeability there is minimal likelihood for significant transmittal of any potential contaminants laterally within the shallow portion of the aquifer system. The base of the SAS unit shows a relatively consistent layer of clay material having low permeability. The exact nature of the confinement overlying the IAS is unknown.

The PHIR includes an estimate of a leakance coefficient, which is a measure of the amount of water that would move vertically through the confining layer; however, the methodology used for the analysis is not highly reliable because the measurements of permeability are only specific to unique locations and relatively small depth (thickness) intervals. The best method of estimating leakance is from pumping tests conducted within the underlying Intermediate aquifer system. Ideally shallow aquifer piezometers would also be incorporated into such testing to observe relative water level reactions between the shallow sediments and the permeable zones of the IAS. We recommend additional testing be performed on the producing zones of the IAS at the project site. The application addresses potential recharge to the Floridan Aquifer System, but does not adequately characterize the Intermediate Aquifer System, which has significant use in Charlotte County.

The lithologic characterization of the IAS, including the elevation and thicknesses of PZ-2 and PZ-3, has not been determined at the project site. The PHIR report includes driller's logs from numerous wells located within a one-mile radius of the project site. The majority of the driller's logs show the presence of a limestone unit with its top at a depth ranging from about 50 to 60 feet beneath the project. The on-site soil borings terminate at 50 feet below

grade. Site specific testing should be completed at the site to determine aquifer hydraulic properties and hydraulic connections between the SAS and the IAS.

It is apparent from available water level data presented in the PHIR that the potentiometric surface of the IAS is lower than that of the water table on-site, which indicates the site does provide recharge to at least the uppermost zone of the Intermediate aquifer system. The *United States Geologic Survey (USGS) Water Resources Investigation Report 01-4015, Hydrogeologic Framework and Geochemistry of the Intermediate Aquifer System in Parts of Charlotte, De Soto, and Sarasota Counties, Florida* (Torres, et al, 2001) which was referenced in the PHIR, includes geochemical modeling of water movement in the IAS based on water chemistry and isotropic data.

The geochemical model NETPATH was used (Torres, et al, 2001) to evaluate horizontal flow within permeable units and mixing between overlying and underlying aquifers. Selected production zones in Southwest Florida Water Management District (SWFWMD) Regional Observation and Monitoring Point (ROMP) sites were used for the simulations. A simulation of water movement in PZ-2 between ROMP 5 (located about 20 miles west of the site) and ROMP 13 (located about 6 miles northeast of the site) indicates "A plausible model for this flow path had 44 percent of water moving laterally, 32 percent recharging from the surficial aquifer system, and 24 percent moving upward from PZ3." The results of this geochemical model indicate a potential of recharge from the SAS to the IAS. We recognize that the USGS report (Torres, et al, 2001) does indicate that generally there is little hydrogeologic connection between the SAS and PZ-1 and PZ-2 of the IAS because of the presence of confining units. However, considering on-site head differences between the SAS and IAS, the modeling suggesting that recharge may occur, and a lack of site specific data regarding the IAS, there is insufficient information in the PHIR to quantify how much recharge is generated on site or to disqualify the project site as a recharge area for the IAS. Additional SAS and IAS water level data collection and aquifer hydraulic testing should be conducted to address potential recharge to the IAS. Based on our review of the existing data sources, the FAS in the project area appears to be well confined and the project area would not likely be considered a recharge area for the upper Floridan aquifer.

The project site is located on a larger parcel that maintains a water use permit (WUP) with the SFWMD for the irrigation of citrus. The permit (WUP No. 08-00006-W) indicates the presence of nine wells. Based on exhibits in the permit, it appears that at least five of these wells are located on the project site. Two of these wells have unknown construction details. Three of the wells have casing depths between 78 and 126 feet below grade with total depths that range between 480 and 522 feet. The Staff Report for the permit indicates that the open hole interval of the wells are open across three aquifers (termed by the SFWMD as the Sandstone, mid-Hawthorn, and the Lower Hawthorn aquifers). Current SFWMD regulations do not allow installation of wells across aquifers to prevent water flow across aquifers and potential cross contamination (typically saline water). Wells located on-site may be used for limited testing purposes, and should be properly abandoned by a licensed water well driller.

Summary/Recommendations for Additional Information

The technical review of the Calusa Green application has shown that the applicant has addressed many of the necessary geologic and hydrogeologic aspects to protect natural resources. However, there are additional items that need to be addressed. Listed below is a summary of the additional actions, studies, and information required.

- Assessment of groundwater and surface water quality
- Determination of aquifer hydraulic parameters
- Additional data on SAS and IAS on-site and near-site water levels
- Assessment of hydraulic connection between aquifers
- Quantify aquifer recharge between SAS and IAS
- Data on average and maximum high groundwater levels
- Discussion of site foundation suitability
- Address source of potable water
- Address disposition of on-site irrigation wells

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Cardno ENTRIX appreciates the opportunity to provide geologic and hydrogeologic services on your behalf. Should you have any comments or questions, or require additional information, please do not hesitate to contact Lloyd Horvath or Gary Susdorf.

Sincerely,

Lloyd E. Horvath, P.E.
Vice President / Technical Director
for Cardno ENTRIX
Direct Line: 239.829.7008
Email: lloyd.horvath@cardno.com

Gary Susdorf
Hydrogeologist
for Cardno ENTRIX
Direct Line: 239.829.7025
Email: gary.susdorf@cardno.com

LEH/GS/gng

Attachment: Exhibit A

cc: Dan Quick – Charlotte County

File: Charlotte County\03840002.00\leh_cccdd_dq_ltr